POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The regular weekly meeting of the Association was held in their room at the Cooper Institute on Thursday evening, May 22d, the President, Prof. Joy, in the chair.

The only miscellaneous business introduced was the presentation to the society of J. W. Nystrom's book containing an exposition of his

NEW SYSTEM OF ARITHMETIC,

with 16 for the base in place of ten in the present decimal system. The work was referred to a committee, and the society proceeded to the discussion of the regular subject of the evening—

PRINTING IN COLORS.

Mr. FISHER—It is well known that the success in printing in colors has been very imperfect, and I suppose that this is owing to the want of artistic knowledge and taste ou the part of the operators. Brewster ascertained that all colors are formed by the combination of three : red, yellow and blue, which he called the primary colors. Now, I suppose that if these three were properly blended, all colors and all shades of color might be produced. Perhaps black might also he employed with advantage. I suppose that nine-tenths of the colors and shades employed in portrait painting might be produced from red, blue and black.

Dr. STEVENS—Probably the man who first printed in colors was Faust. Before the art of printing with movable types was invented it was customary to ornament the manuscript books with illuminated letters of various colors, and in order to make the printed books as nearly like those in use as possible, the printers undertook to print their initial letters in colors, and they produced some very fine results. But the practice after a while fell into disuse. At the present time printing in colors is carried on in this country with very satisfactory results, though not so well as in England and Germany. Maps especially are printed in this way, so as to rival those colored by hand. Prof. Rodgers, formerly of this country, but at present of Edinburgh, had a geological map printed in this way, which is nearly, if not quite, equal to any colored by hand. Each color is put on by a separate stone ; though after all of the sheets are printed in one color from a stone, the color may be wiped off, and the same stone may then be prepared for another color, with which all of the sheets may be printed.

Mr. GAVITT—Mr. President, I received your invitation so short a time before the meeting that I have made no preparation, and my remarks must be very desultory. The American Bank Note Company print their bills in colors as a guard against counterfeiting by the photographic process. If a bill is printed partly in red, the counterfeiting photographer must remove the red before he photographs the rest of the bill, and the red must then be printed in. The colors formerly used could all be readily removed, but it was suggested by one of the most eminent chemists in the world, Mr. Sterry Hunt, that the sesquioxide of chromium would be found as permanent as the black carbon ink. We have accordingly adopted this pigment, and hence the great quantity of green you see in modern bank notes, especially in the United States Treasury Notes. The sesquioxide of chromium resists the action of all acids except boiling nitric acid, and that destroys the texture of the bill. The only way in which it can be removed is by saponifying the oil which is employed as a medium to attach it to the paper, and as the same medium is used for the carbon ink, if one is removed they both go together. We print the green over the black, and this we consider a perfect safeguard against counterfeiting by photography.

Prof. SEELY—I think, Mr. President, that this apprehension of counterfeiting by photography is a bugbear. I have frequently heard of bank notes that were counterfeited by photography, and I have been told that if I would go to this place or that place, I should see one so perfect that it could not be distinguished from the genuine note. The narrators seem not to have considered that this fact would destroy the evidence of its being a counterfeit. If it could not be distinguished from the genuine bill how can it be known that it is not genuine? And I presume that in most of the cases in which it was supposed that bills had been counterfeited by photography, genuine bills were mistaken for counterfeits. I have seen photographs of bank notes ; I have made some myself, but I never saw one that could not be readily detected, or that had been in circulation. Here is a bill printed wholly in black, and there are a great many such in circulation. If it is so easy to photograph black notes why are not these counterfeited. It must be either because photographers are not able to do it, or because they are all too honest.

Mr. GAVITT—Mr. President, I will ask Prof. Seely one question. Here is a bank note with the letters, ONE, in red ; now, is it more difficulty to photograph that note than it would be if those letters were printed in black?

Prof. SEELY—It is more difficult, certainly.

Mr. GAVITT—Very well, Mr. President, that is sufficient. I hold that it is the duty of bank officers to furnish the community with every possible safeguard against the danger of being swindled by false notes, and if it is in any degree more difficult to counterfeit a note printed in colors, then all notes should be printed in colors without any regard to the expense. I agree with Prof. Seely that the danger of circulating photographs of bank notes is a bugbear, but photography may be employed to produce lithographs of bank notes, which are the most dangerous counterfeits. There was a publication of a bank note detector started a few years ago on a new plan. It was to have facsimiles on a small scale of all the genuine bank notes in the country. You probably remember the work. Photographs were taken of just one-sixth the size of the bills, and then these were transferred to stone by the photo-lithographic process, and the bills were then printed from the stone. The photographs were made by Mr. Rehn, one of the most skilful photographers in the world, and the prints were perfect copies of the bills. It was only necessary to take a glass that would magnify just six times, and you had the exact thing. The most delicate lines were all reproduced with wonderful accuracy. Some of these lines, being so much reduced in size, were absolutely finer than the fiber of the paper, and we were obliged to have a cardboard surface in order to print them. But, of course, if not reduced they might be printed on bank-note paper. Counterfeiting by photography is a bugbear, but not by photo-lithography.

Mr. ROWELL—Have any of the United States Treasury Notes been counterfeited?

Mr. GAVITT—They have not?

The PRESIDENT.—How much of the sesquioxide of chromium is used for bank-note printing?

Mr. GAVITT—Nearly all that is used is used by the American Bank Note Company. We have consumed about 10,000 lbs. within the last three years. It costs about a dollar a pound in large quantities.

The PRESIDENT—There is a process of printing in colors practiced in Germany, called nature printing. A natural object—a leaf for instance—is placed under a thin sheet of pure lead, and passed between rollers. The leaf is pressed into the lead, forming a mold for an electrotype plate, which is employed for printing. Inks of the proper color are used in the printing, and where several colors are required they are worked on the same plate so as to print the whole at one impression. The Consul General of Austria, Charles F. Loosey, presented several magnificent volumes of these prints to the American Institute a few years ago. It was a most valuable and acceptable donation, and I trust was properly recognized and appreciated.

A volume of the prints was brought from the library and greatly admired by those present.

The subject of "Illuminating Materials" was selected for the next meeting, and the society adjourned.

History of Columbiads.

Benton, in his work on "Ordnance and Gunnery," recently noticed in the SCIENTIFIC AMERICAN, gives the following history and description of columbiads :—

The columbiads are a species of sea-coast cannon, which combine certain qualities of the gun, howitzer and mortar ; in other words, they are long, chambered pieces, capable of projecting solid shot and shells, with heavy charges of powder, at high angles of elevation, and are, therefore, equally suited to the defence of narrow channels and distant roadsteads.

The columbiad was invented by the late Colonel Bomford, and used in the war of 1812 for firing solid shot. In 1844 the model was changed, by lengthening the bore and increasing the weight of metal, to enable it to endure an increased charge of powder, or one-sixth of the weight of solid shot.

Six years after this it was discovered that the pieces thus altered did not always possess the requisite length. In 1858 they were degraded to the rank of shell guns, to be fired with diminished charges of powder, and their places supplied with pieces of improved model. The changes made in forming the new model, consisted in giving greater thickness of metal in the prolongation of the axis of the bore, which was done by diminishing the length of the bore itself ; in substituting a hemispherical bottom to the bore, and removing the cylindrical chamber ; in removing the swell of the muzzle and base ring, and in rounding off the corner of the breech.

From the fact that all the trial pieces have successfully endured very severe tests, it is to be inferred that the defects of the previous model arose from the presence of a cylindrical chamber, and a deficiency of metal in the prolongation of the bore.*

In 1860 the model proposed by Captain Rodman was adopted for all sea-coast cannon.

The following are the principal dimensions, &c., of the new columbiads :—

Length of bore.....	8-inch, about 14 diameters. 10-inch, about 12 diameters. 15-inch, about 11 diameters.
Weight.....	8-inch, 8,500 lbs. 10-inch, 15,000 lbs. 15-inch, 50,000 lbs.
Charge—shot and shells.	8-inch, 10 lbs. 10-inch, 15 lbs. 15-inch, 40 lbs.

The great disparity in the diameters of the reënforce and muzzle, renders it impracticable to fix an artificial sight to the muzzle ; a small projection is therefore cast on the upper side, between the trunnions, as a seat for the front sight.

*Six of the trial pieces (three 8-inch and three 10-inch), made at different foundries, endured successfully upward of 1,000 service rounds. Two 10-inch pieces (one cast hollow and the other cast solid) were fired 2,300 rounds with solid shot, and 14 lbs. of powder, and 1,632 rounds with 18 lbs. of powder and solid shot. The only injury sustained was the enlargement of the bore by the cutting action of the gas as it passed over the shot. The enlargement of the bore of the solid cast piece was much greater than in the hollow one.

Improvement in the Oxyhydrogen Light.

At the April meeting of the Manchester Literary and Philosophical Society Mr. Alfred Fryer stated that he had recently been making a series of experiments with the oxyhydrogen light, with a view to determine what substance made incandescent produced the greatest amount of light. He operated on various salts of calcium, magnesium, strontium, barium, and also upon some other substances. The best results were obtained from magnesium.—The sulphate of magnesia, when baked, yielded a bright light, but was decomposed by the heat ; and the sulphurous acid escaping was very unpleasant. Calcined magnesia succeeded the best of all ; but when the powder was used, the gases blew it away. When the powder was mixed with water, and afterward dried, the cake was friable ; and when the dry powder was pressed into a mold by means of hydraulic pressure, the cake split up into laminæ when subjected to the gases. After many experiments with the materials in different proportions, it was found that sulphate of lime one part, and calcined magnesia two parts, mixed with water and modeled into a cake and dried, produced the best results. This, however, is not all that could be desired, as in time the cake becomes cracked and fissured by the gas. The illuminating power is to that of lime, pressure and volume of gas being equal, as 54 is to 27. The experiments have been conducted with oxygen and the coal supplied to Manchester. The jet used is a form supplied by Mr. Dancer, a jet of oxygen being surrounded by an annular jet of the coal gas. Mr. Dancer has further improved the jet by allowing the oxygen pipe to project beyond the hydrogen, and by not contracting the aperture of the hydrogen pipe. Mr. Alfred Fryer exhibited the light which he had explained, and the effect produced was very striking.

Preparations are making for what is termed a "World's Horse Fair," to be held in Chicago in September. Premiums to the amount of $25,000 are announced.

PHOTOGRAPHY AND FORGERY.

The following interesting article is from the *Photographic News* :—

The facilities afforded by photography, and more especially by photolithography, for effecting forgeries of bank notes and other documents, appear to have been considerably overlooked by those who are, or should be, most concerned. The sources of danger have been looked for in other directions, and it is from the imitative skill of the skillful engraver that counterfeit productions have been feared. In regard to Bank of England notes, a great safeguard has been believed to exist in the inimitable character of the paper, in quality, design of water mark, &c. But since the robbery of bank note paper, from the Laverstock Mills, this reliance has vanished into thin air, as the genuine paper manufactured for the bank authorities is now actually in circulation as the basis of the forgery. The bank authorities themselves rely upon the simplicity of the design and characters upon their notes, and upon the mode of printing adopted as their surest protection against imitation. Others maintain that complexity of design, produced by artists of the first ability, is the truest source of safety, arguing that, notwithstanding the skill and enterprise which have, unfortunately, been engaged in the nefarious profession of the forger, it must always happen that genuine art will be in advance of the spurious, or counterfeit art. It is further argued that the number of persons who would be able, with any chance of success, to imitate the designs of genius, must necessarily be very few, and "these," as it is argued by an old writer on the subject, "by the legitimate use of their talents, can acquire competence ; they, therefore, are not likely to employ their time, or risk their lives, in felonious imitations. Nay, if, in the perversity of the human mind, a first-rate artist were inclined to turn forger, he could not then do it successfully, because, even in the very first rank of historical engravers, one cannot imitate the engraving of another in a work of importance without the difference of manner being visible."

Adopting these and similar arguments, the bank authorities have held, we believe, that their position was impregnable, and that the precautions against forgeries of their notes were as complete as it was in the nature of things, or at least in the present state of science, possible to make them. Moreover, they may, and we believe do, argue, no forgery has ever yet been executed which they could not, themselves, detect ; and as they could only become losers by counterfeits produced with such skill as to deceive their own tellers, and induce them, without question, to convert them into specie, they were not called upon to entertain further anxiety upon the subject. They believe that their own safety from deception is absolute, and that, for the public safety, they have done sufficient, or, at least, all that was possible ; and there the matter must rest.

But the imitation produced by photography is absolute in all its parts. The most complex design of the most skillful artist is as easily produced as the most simple commonplace production of the greatest bungler. The secret marks, however unobtrusive ; the signature, no matter how marked its individuality or character, are all unerringly produced by the lens and camera, in the negative image. The ordinary silver print from such a negative, it is true, whilst it might deceive some persons if well executed, would speedily be detected on careful examination. It is for this reason, we donbt not, that the subject has received comparatively little attention, and excited no apprehension hitherto. But this is not the real danger. It is from the processes of photolithography, photoglyphography, and similar processes, by which photographic impressions can be produced in printer's ink, in the very material, and of the exact tint of the original, that the danger is to be apprehended ; and that danger threatens the bank authorities themselves as well as the public, for it is possible to produce, by these means, imitations, which not the most skillful teller, or the most practiced expert, could detect, or make oath as to the forgery.

Let us take the case of photozincography, photolithography, or the processes which have at present attained the highest state of perfection. The first of these methods, the invention of Colonel James, is practiced at Southampton, for the production of the maps produced in the Ordnance Survey. The second, the invention of Mr. J. W. Osborne, is practiced under his superintendence, at Melbourne, for the production of the maps and plans issued by the Colonial Government of Victoria. Specimens of the work of both these gentlemen are exhibited in the International Exhibition. *Fac-similes* of maps, engravings, manuscripts, pages of printed books are exhibited, all of which would defy detection. These are gentlemen, it may readily be said, from whom there is no danger of forgery. But their processes are made public ; and not only may be, but actually are, practiced by others. We refer those interested in the matter again to the International Exhibition ; Mr. Ramage, of Edinburgh, exhibits a series of photographs in the British Photographic Department, perhaps the finest we have seen. By which process they are produced is not stated, but it is probable that the method is similar to that of Mr. Osborne. They are very perfect copies of engravings, and we have no hesitation whatever in saying, that, by the same method and the same manipulator, *fac-similes* of Bank of England notes might be produced which would entirely defy detection. It so happens, that these notes offer very especial advantages for imitating by such means. The design is clean, bold, and well marked : they are produced, not from engraved plates, in intaglio, printed at the copper-plate press, the printed impression of which always presents a slight amount of relief which may be felt by the finger ; but by block printing at an ordinary typographic press. Such an impression can, therefore, be imitated by the photographer without difficulty, and in such a manner that the Bank authorities themselves may be deceived.

Mr. Osborne, who is now in London, on a visit to the Exhibition, recently informed us, that wishing to call the attention of bankers in Melbourne to this danger, he produced by photolithography copies of various of their signatures, of which they admitted they would be unable to repudiate the genuineness. Any color of ink, resembling either printing or writing ink, or any number of colors, may, of course, be easily produced, so that an actually written signature, instead of the printed signature now used, would not be an absolute safeguard.

We do not enter at present into any extended examination of the means by which such forgeries might be prevented, our object being rather to call the attention of those concerned to the existence and imminence of the danger. The means of prevention require careful consideration, and are not so easy and simple as might at first sight appear. Some years ago the subject came under consideration in the United States and in Canada. Colored inks were employed for some parts of the note, and black for the other ; but it was found that the colored inks, not possessing, like black, a carbon basis, were easily discharged by chemical means, and photographic copies of the remainder easily produced, the colored portion being supplied by a subsequent operation. This difficulty was subsequently met by the use of a green formed of the oxide of chromium, which resisted the action of chemical re-agents. A geometrical pattern in this color was printed first all over the paper, and the value, denomination, &c., of the note subsequently printed upon that in the usual way with black ink. This was an effectual check to ordinary photographic imitation, but it would be little or no check to the photolithographer, whose art would furnish him with means of evading this difficulty. A variety of means might be suggested of making the imitation difficult, but they would require more consideration than we can now give to the subject.

We may remark, before concluding, for the information of those of our readers who may be tempted to amuse themselves with experiments in this direction, that the pastime is a dangerous one ; as the attempt to copy one of these notes by any process whatever, and for any purpose, is a felony, the consequences of which might be awkward.

FLAX IN IRELAND.—It was supposed that the loss of the cotton crop would lead to a large extension of the growth of flax this year in Ireland. It appears, however, from the returns issued by the *Irish Registrar General*, that the total increase has been only to the extent of nineteen hundred acres. In the south and west of Ireland the cultivation of flax has actually decreased since last year.

Ox Teams and Horse Teams.

The *Massachusetts Plowman* has been making a comparative estimate of the value of horses and oxen. We extract as follows :—

It is generally agreed that horses travel faster than oxen, and that on a farm consisting of plains and destitute of rocks, a pair of horses will do more on the plow and harrow than a pair of oxen. Horses will wear longer than oxen ; that is, farm horses will last to work till twenty years old, but oxen should not be kept half so long, though some work till they are fourteen. But after admitting so much, we may be allowed to say a word or two in favor of the practice of keeping oxen. And first, as to the cost of the animals. Oxen of equal weight with the horses are bought for one half price. Oxen are worth something after they are worn out in work—horses are not. Oxen are not half so liable to disease as horses are. An insurer will ask four fold more for insuring the health of horses than of oxen. The gearing for oxen costs less by half than that of horses. A wooden yoke lasts longer than leather harness, and it is put on and off in half the time. One chain answers for two oxen, but two horses must have four. Oxen are more patient than horses, and will carry a more even yoke. They start a load better than horses, particularly in a snow path, where the runners stick to the snow. Oxen can be entrusted with hired men at less risk than horses. They are soon taught to draw the plow, and are driven by the plowman without any reins. We have not a large proportion of farms without rocks and stumps, and where the land is rocky there is no comparison between oxen and horses. In regard to cost of keeping, there would be but little difference if both were kept on the same food. But many of our farmers keep oxen through the winter on coarse hay, straw and husks, which would not keep horses alive. Our own oxen (half-blood Devon) never have any but cheap hay, husks, &c., through the winter, though they labor much of the time. When April comes they are kept on good hay, and they learn the difference between cheap and costly living. Oxen of the right breed are very readily fattened, and their beef is better than that of cows or young cattle, and brings more in the market.

New Method of Preparing Phosphorus.

M. Cari-Montraud gives the following new method of preparing phosphorus in the *Moniteur Scientifique* :—

Taking advantage of the long-established fact of the decomposition at a high temperature of dry phosphate of lime mixed with carbon by hydrochloric acid, M. Carl Montraud founds upon this reaction a new process for the preparation of phosphorus.

Calcined bones finely powdered are mixed with sufficient pulverized wood charcoal to convert all the oxygen of the tribasic phosphate of lime into oxide of carbon. The mixture is put into fire-proof earthen cylinders, glazed inside, which are three parts filled. These cylinders being made red-hot, a current of hydrochloric gas is passed in at one of the extremities. Under these circumstances the phosphate of lime decomposes immediately. Chloride of calcium, oxide of carbon, hydrogen and free phosphorus are formed. The phosphorus is distilled, and is conducted, together with the oxide of carbon, the hydrogen and the excess of hydrochloric gas, by means of a copper adapter, into a vessel filled with cold water, where the phosphorus vapors are condensed. The water of this refrigerating condenser, becoming very acid by the absorption of the excess of hydrochloric gas, is utilized by putting into it the calcined bones, where they are dissolved or softened, rendering pulverization unnecessary.

The magma resulting from this maceration is mixed with carbon, and the whole evaporated to dryness before being put into the cylinders.

Hydrochloric gas is produced by the decomposition of sea-salt by sulphuric acid. The chloride of calcium forming the residuum in the cylinders can also be utilized by treating it with sulphuric acid, which regenerates the hydrochloric gas, whilst the lime is converted into sulphate of lime, which is useful for manure. Chloride of calcium can also be decomposed by aqueous vapor.

From January 1st, 1862, to 31st August, 362,232 tuns of Scotch pig iron were exported.

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PAPER MONEY AS A GOVERNMENT RESOURCE.

By the census statistics of 1860 the aggregate property in the United States amounted to sixteen thousand millions of dollars. The bank notes in circulation amounted to two hundred and seven millions, and considering that in the Pacific States the currency has hitherto been exclusively metallic, there may have been enough specie in circulation to make the whole money of the country three hundred millions of dollars, which is less than two per cent of the whole property of the community.

A portion of the sixteen thousand millions of property belonging to the citizens of the country consisted of gunpowder, flour, beef, &c., and of this the Government wanted one thousand millions of dollars' worth to carry on the war. How was the Government to obtain possession of this property?

A portion of it the Government was able to borrow, promising to return an equal value at some future time. There were numerous individuals in the community who had property which they could not use to advantage, and they were willing to loan it to the Government. This property existed mostly in the form of merchandise, but it was not for the most part in the kind of merchandise which the Government wanted, so the exchange was effected like other exchanges of property, through the medium of money. The holders of the property sold it for money and loaned the money to the Government, and then the Government exchanged the money for the merchandise which it needed. The only office which the money performed was to effect the exchange of the commodities. Pieces of green paper and little disks of gold and silver are of no more service in battle than pebble stones. War cannot be carried on by means of money unless the money can be exchanged for the needed commodities.

A second mode in which the Government could obtain a portion of the property of the citizens was by taxation—simply seizing it by means of the physical force which was under the direction of the authorities.

The third plan adopted was the issuing of notes of the Government, designed to circulate as money; it being supposed that any persons who owned gunpowder, horses, or any other property which the Government wanted, would willingly give their property in exchange for these notes. What was the effect of this measure?

As payment was refused by the banks on the two hundred millions of their notes, and as the Government did not redeem its notes, the two circulated together, swelling the amount of our currency. This led to a general advance in prices. Every thing which the Government now buys it must pay 33 per cent—the present premium on specie—more for than it would if the currency had not been disturbed. As the other loans to the Government are also being paid in this depreciated currency, while they will be repaid in coin, the whole accruing debt is swollen to the same extent. The debt is contracted with one measure of value to be repaid with another, and the change is against the Government. This issue of small notes, making them a legal tender, is in fact a forced loan, and of all modes of obtaining the property of the citizen, it is the most costly to the Government, and one of the most disastrous to the people. It operates in precisely the same manner as a debasement of the coin—a measure repeatedly adopted by feeble tyrants and which has always proved exceedingly injurious wherever it has been tried. The money belonging to any community forms a very small part of the total property of the community, but it is an exceedingly important part. It is the measure of all values and the basis of all contracts. No other act can introduce so general confusion into the industrial operations of a community as an alteration of the value of the currency. This act impairs the obligations of all contracts and overthrows all prospective calculations.

The experience of France with the issue of *assignats*, that of James II. with his brass guineas, that of this country with its continental currency, and that of many other nations have demonstrated that, when the currency has been depreciated beyond a certain limit, it will be refused in the exchange of commodities, and will cease to perform its office.

Desiring the suppression of the rebellion and the salvation of the country as warmly as the safety of our own lives, we yet warn the Administration to devise other means for obtaining the property which it needs than the unlimited issue of "green-back" notes.

LUPINE AND CROOKED BEAM PLOWS.

On another page will be found the article contributed by Louis Schade to the Patent Office Report for 1861, on the Lupine plant. It will be seen that this plant is cultivated mainly for enriching land by plowing in the green crop, and it is possible that some of our readers may like to know what kind of plow is best for turning in the green crops.

Some years since, the writer of this had sixty acres of timothy meadow in Illinois ruined by army worms, and pig weeds sprung up over the whole field. In the fall it was determined to plow these weeds in, and a crooked beam plow was constructed for the purpose. To make the beam of sufficient strength, it was desirable to have the natural crook of the wood, and to obtain this an oak tree was dug around, and a portion of the root cut off with the trunk. In this way a beam was obtained so crooked that when made into the plow the highest part stood nearly three feet above the ground.

Three horses abreast were attached to this plow, and a man was set to work plowing in the weeds. So wonderful is the fertility of the Western prairies, that, though the statement may seem incredible, it is a fact, when these three horses with their driver had started in among the weeds, they were as completely hidden from sight as if they had marched into a forest.

But these tall, thick weeds were rolled under by the high beam plow without the slightest difficulty, and the whole field was smoothly and handsomely plowed.

MORE ABOUT COTTON AND ITS SUBSTITUTES.

The English mind seems to be in such a state of excitement respecting a deficiency of cotton that it grasps eagerly at every proposed substitute for it. A few weeks since some beautiful samples of prepared jute were exhibited in Manchester, and it was asserted they could be spun on cotton machinery, when lo! the price of jute advanced in a few days fifty per cent. Two weeks ago we pointed out the natural defects of jute, and from foreign papers received since then, we learn that English cotton manufacturers have become convinced that it cannot be used as a substitute for cotton. But the jute excitement was no sooner quieted than another substitute for cotton was brought before the Manchester manufacturers in the form of a very beautiful fiber obtained from the *zostera marina*. This fibrous material was prepared by Mr. Henry Harben, who at a late meeting of the Manchester Chamber of Commerce, exhibited several samples of the article, and described the plant from which they were obtained. It was admitted that the fiber greatly resembled cotton, and that it could be carded and spun on cotton machinery.

The plant which produced the fiber is the well-known *alva*, which is largely used by upholsterers for stuffing mattresses and cheap cushions; coarse paper is also manufactured from it both in America and Europe. It is a flowering marine plant and grows with its root in the sea-water. We judge that it cannot take the place of cotton as a substitute, because it contains a large amount of vegetable gluten, which must be separated by fermenting and washing, thus involving fully more expense than flax to prepare. The great advantage which cotton has over all the substitutes proposed is that it can be prepared for carding by simple ginning, whereas jute, flax and the *zostera marina* require to be treated by both chemical and mechanical processes.

A contributor to the Manchester *Examiner and Times* asserts that there is more cotton in Liverpool than has been reported, and that the exact quantity has been underrated for speculative purposes. From his statement we would conclude that the stoppage of so many of the English cotton factories was due to a want of demand for manufactured goods rather than a deficiency of cotton. His statement may not be reliable, but he says there are now 170,000 bales in Liverpool, and that in the course of the present year there will arrive from India 450,000 bales; from Egypt 40,000; from Brazils 55,000; from Greece 10,500; Italy 12,500; Malta 5,000; America 5,000; Turkey 50,000; making a total of 798,000 bales. The quantity of American cotton is under-estimated we believe. More cotton has been received at New York lately than most persons are aware of. Exclusive of the cotton taken by our cruisers, no less than 15,066 bales were received during the four weeks ending the 11th inst. A considerable quantity of this came from the southwest by railroad. At present the prices in New York are 57 and 57½ cents per lb., for middlings, which is higher than it has been for half a century.

MALACHITE AND WORKS OF ART.

If copper were as unoxydizable when exposed to the atmosphere as gold or silver, it would be esteemed one of the most beautiful as it is one of the most useful metals. When polished, it is of a deep red-dish color, but it soon becomes dull, owing to a portion of its surface combining chemically with the oxygen of the moist atmosphere, and forming a thin greenish coating. This green oxide is copper rust. Some of the ores of copper are exceedingly beautiful, especially the green and blue carbonates, the former called "malachite." It usually accompanies the ores of copper, but it has been found in the largest masses, and greatest abundance in certain mines in Siberia; and Russia is the only country which has attained distinction for the manufacture of articles from it. Sir Roderick Murchison, the eminent geologist, who has examined the Russian mines, supposes that this carbonate of copper was once in a liquid state, and that it gradually solidified by slow dropping. Every mass of it seems to have been grouped around a center, in nearly concentric layers, and according to the varying richness of the solution at different periods during dropping, the concentric layers varying in dark and light tints of beautiful green. The masses of malachite found in the Siberian mines are generally of a rounded form. This mineral is softer than marble, but it is much heavier; quite brilliant, and its green tints have a silky appearance. It has been held to be a gem by some writers, and it almost deserves to be classed among the precious stones of the jeweler. It is fragile and very difficult to work. Although seldom found in lumps weighing more than twenty pounds; masses have been found in the Ural mountains, in the mines of M. M. Demidoff, of St. Petersburg, in masses of several tuns weight. It receives a very high polish, and is chiefly used in the production of rich inlaid cabinet work, such as tables, mantel pieces, work boxes, snuff boxes, vases. In several of the palaces of the emperor of Russia, there are rooms in which the furniture is mostly veneered with malachite.

At the celebrated Malachite Works of M. M. Demidoff, in St. Petersburg, the largest pieces of malachite are first reduced to blocks, then they are cut into thin veneers, with circular saws. A block of malachite being secured upon its carriage, it is fed toward a revolving circular disk, and fine sand and water are fed into the cut until the veneer is severed, in the same manner that marble slabs are cut out. In every piece of malachite, there are light and dark streaks of green, and their curves are as graceful as some of those in veneers cut from mahogany crotches. These veneers of malachite are cut to the proper form, so as to combine the varying tints in

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NEW YORK, SATURDAY, NOVEMBER 15, 1862.

SEVENTEEN THOUSAND PATENTS SECURED THROUGH OUR AGENCY.

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THE CONTROL OF STEAM BOILERS.

The control and management of steam boilers is one of the most important duties devolving npon those who have the supervision of steam machinery. To paraphrase an old proverb, it may not incorrectly be said : "Take care of the boiler and the engine will take care of itself." Although this advice is by no means to be strictly interpreted, it serves to illnstrate the force of onr argument, which is, that all the attention and care that can be given to the subject in question will be amply repaid. The boilers are the seat of force and develop the power required ; into their doors, as into the crncible of the refiner, enter directly the gold and silver of the proprietors. In the proper management of it and in rendering a full equivalent therefor, lies the whole art and secret of snccessful management. It has been asserted that boilers are in too many cases overtaxed, and our observation and experience convinces ns of the truth of this statement. In numberless instances we have seen boilers where the crown sheet was most inadequately stayed to the shell ; the crow feet being eighteen inches apart or more, the braces few and insufficient in size, the socket bolts mere pins, and the water spaces altogether too narrow to admit of a thorough circulation of the feed-water. A boiler in the condition last described carried a nominal pressure, according to safety valve weight, of 75 lbs. ; upon attaching a gage and testing the actual pressure it was found to exceed this figure by nearly 20 lbs., per square inch, showing of course an error in calculation. Some time afterward we examined this same boiler and found the crown sheet forced down fully an inch from a true plane ; It was no more than was to be expected under the circumstances, and we cite the above instance as one fresh in our mind of imperfection, where safety and economy ought to be assured beyond doubt.

Boilers are mnch neglected ; because they have no outwardly visible joints, pins, or other mechanical attachments, they are slighted and left to take care of themselves. But the difference between one well cared for, and one neglected, is just as apparent to the practical eye as it is in the engine. If on opening the furnace doors we find the flues or tnbes half full of ashes and cinders ; if upon removing the hand hole plates, the water spaces in the legs and front are found obstructed and a heavy deposit of sediment, scale, mnd or refuse of any sort choking np the various passages, we have the most incontrovertible testimony that the engineer is unfit for his place, and that he is daily jeopardizing the lives of those in his vicinity and ruining his employers' property. The above combination of details is not by any means unlikely to occur ; nearly all practical men will bear us ont in this assertion, and will call to mind similar cases that have come under their own observation. When the daily duty of a boiler is once ascertained, it is easy to limit its performance within certain bounds. If a pressure is required of 75 lbs., carry that amount ; not 85 one hour and 65 the next ; that would show carelessness in firing. If the construction of the boiler demands that the feed should be kept up to the second or third gage, keep it there, don't let it rise and fall above or below, one or the other ; that involves a waste of coal. Pumps in good order force, if the reservoirs be full, an equal quantity at every stroke of the plunger, and we can readily understand how the feed being once regulated will go on in its daily routine with as much certainty as any other well kept apparatus. These matters will doubtless seem trivial and unworthy of notice, but it is through attention to details that great results are achieved. It is no controversion of our argument to say that, because a boiler has not exploded or does not explode while the vices above-mentioned are daily carried on, care and supervision are thrown away. Even if an immediate and terrible disaster does not occnr, it is not through any merit of those who expose the boiler to such danger. In any event costly property is greatly deteriorated and money shamefully wasted by carelessness and want of attention to the various minutiæ which make up the grand total of skill in engineering. Every engineer may learn something from unskillful persons ; he may see in their want of attention to these grave matters what loss of property to the manufacturer and what ruin of reputation to the engineer is involved through shiftless and wasteful habits.

WHY MONEY IS WORTH ONLY FIVE PER CENT.

There is no class of questions which excite more universal interest than those which relate to the acquisition, distribution and accumulation of property, and among these questions one of the most important is that of the causes which determine the rate of interest. These are perfectly simple, and are easily understood if we take the trouble first to understand what it is that is borrowed and loaned in the market as capital.

If we step into the office of Robbins, the great note broker in William street, we shall see retired merchants and others coming in from time to time during the day, and looking over the notes and acceptances which have been left with him for sale, and when they find the note of a firm which they think is sure not to fail, some of them will, if the rate is satisfactory, purchase the paper ; in which case the clerk reckons the discount, and the buyer gives his check for the balance. Let us trace this operation and see what it is that passes hands.

In the first step it is doubtless money. The maker or owner of the note delivers it to the buyer, who pays for it either in money or in his order to the bank where his money is deposited. In this, as in other operations, a sufficient amount of money is employed to effect the exchange of values. But if we look a step further, we shall discover that the great bulk of capital which has been borrowed and is bearing interest now exists in the form of cloth, beef, machinery and other commodities. The rate of interest, therefore, is determined by the relation between the supply and demand of capital in all its forms—in merchandise generally—the quantity of coin and bank notes in circulation having very little influence upon it.

In 1849 the writer of this heard a lecturer explaining that the gold mines of California where to make money so abundant that the taking of interest would be abolished ; but when the same lecturer arrived in San Francisco, he found that the current rate of interest on perfect security was ten per cent a month. Though money was more abundant in proportion to the wealth of the people than it ever was in any other community in the world, the total capital—embracing all its forms—was very scarce, and the demand for it was very great. The country was filled with men who had not succeeded at the East, and who were consequently poor, while the extraordinary resources of the State furnished unusual opportunities for the profitable employment of capital. Capital in any other form as well as that of money commanded a large revenue for its use. A rocker that cost $30 would rent for $1 50 per day, and a lot of ground that was offered for sale at $225, commanded a rent of $40 per month.

We shall find in other places a corresponding relation between the rent of land, buildings, machinery, &c. and the rate of interest on money. Indeed, when a man hires money, what he really wants the use of is some other form of property. If a manufacturer leaves his note at Robbins's for sale, or offers it at a bank for discount, though he obtains money in the first instance, he presently exchanges this money for machinery, or raw material, or some article to use in his operations. These articles perform the office of tools in his hands, enabling him to produce a larger amount of value, and thus to pay for the use of his capital. If a merchant hires money, he uses it for the purchase of merchandise, by which he is enabled to do a larger trade and make larger profits, and thus he can afford to pay for the use of the capital. Neither the manufacturer nor the trader could afford to hire money and keep it in the form of money. In this shape it would not earn its interest.

The great mass of capital which is at interest in the country exists, therefore, in the form of merchandise, and the rate of interest depends upon the relative supply and demand of the aggregate capital.

The supply of capital is furnished by all who live within their incomes, and therefore depends mainly upon the provident dispositions and habits of the community. The demand for capital comes from the enterprising and active men in the community who discover profitable modes of employing it. The rate of interest at any time depends upon the relative power of those two classes ; as would be anticipated, this is constantly fluctuating. At the present time in the city of New York it is five per cent.

VISITS TO OUR MACHINE SHOPS—THE ALLAIRE WORKS.

Among the many large shops in this city, for the manufacture of all kinds of machinery, the Allaire Works holds a prominent position. Since 1819, when these Works were first incorporated, they have been steadily occupied in building marine and stationary engines that have created for them the most enviable reputation. Some of the most celebrated ships, in point of speed and economy, have had their engines put in at the Allaire Works. Here was built the famous *Vanderbilt*, the *North Star* and the *Baltic*, or one of her sister ships, comprising the old Collins' line ; and others, whose histories are not familiar to the public generally, have had their massive engines constructed at these Works, from the conception of the design to the fastening of the last rivet in the wheel-arms. The proprietors are at present very busy with their various contracts, of which we give a list, adding previously, however, that some 800 men are now employed upon them.

The frigate *Lackawanna* is receiving a few finishing touches, being nearly ready for sea ; her engines are similar in design to those of the *Ashrondack*, which was lately lost off the Florida coast ; the cylinders are 42 inches diameter with a mean pitch of 17½ feet. The boilers are Martin's patent, with 8,950 feet fire surface. The usual blowers and engines are also being furnished to her.

For the Norwich freight line a beam engine of 54-inch cylinder by 11 feet stroke, and furnished with Sickles' improved cut-off, is building ; the wheels are of wood, 32 feet in diameter by 7½ feet face ; it has one boiler of Erastus Smith's patent, a combination of flues and tubes, with a double row of furnaces. Also one engine for Sanford's line, 56-inch cylinder by 11 feet stroke, similar in detail to the above.

Two inclined engines for side wheel gunboats, 58-inch cylinder by 8 feet 9 inches length of stroke, with overhung Iron wheels of 26 feet diameter and 9 feet face, with Martin's patent boilers, Sewall's condenser and the blowing engines for the boats, are also in hand.

One beam engine for C. Vanderbilt, Esq., 80-inch cylinder by 12 feet stroke, with iron wheels 33 feet